Chapter 3

Methodology: Identifying Natural Communities, At-risk Species and Biologically Unique Landscapes

A Systematic Approach to Biological Diversity Conservation

The task of conserving the biological diversity of Nebraska is daunting. Loss of habitat continues to occur and the list of species that are declining and becoming at-risk is growing, while human and financial resources for conducting conservation remain limited. Because of competing societal demands and limited funds, it is not feasible to conserve every tract of undeveloped land and certainly in a given year, only a small fraction of the land may be conserved. While opportunistic or ad hoc approaches to conservation in the past have done good work, they do not appear to have stemmed the tide of species decline. Therefore, we need to improve the efficiency and effectiveness of conservation action by taking a more systematic approach to identifying and prioritizing what components of biological diversity we are trying to conserve and where in the state we should focus conservation efforts. (See Margules and Pressey 2000, Groves 2003 for excellent overviews of systematic approaches to conservation planning)

A Systematic Approach to Conservation

Identify which components of biological diversity to focus conservation actions on (e.g. species, natural communities)

Identify where to focus conservation actions

- Select sites based on known occurrences of target species and natural communities
- Select sites where there is a high probability that the target species and communities will persist over the long term
- Select sites from across the range of distribution of the species or community to capture important variation

Set quantitative conservation goals so that multiple populations of each target species and occurrences of each natural community are conserved

There are estimated to be more than 30,000 species in the state, the majority of which are insects. There is simply not enough time, personnel, knowledge, or money to work on all these species individually. Fortunately, these species do not occur randomly but co-occur in assemblages (natural communities or habitats) that are repeated across the landscape. The challenge is to focus on a subset of species and communities that will have a high likelihood of conserving the full array of biological diversity. One approach that has been used is known as the coarse filter/fine filter approach (Noss 1987, Hunter 1991).

The coarse filter focuses at the scale of natural communities (habitats), both aquatic and terrestrial. Conserving and managing multiple, high quality examples of each of the various community types in the state (e.g., different types of prairies, wetlands, forests, etc.) should conserve viable populations of most species. For those species that fall through the pores in the coarse filter (primarily rare, imperiled, or wide-ranging species), a species by species (fine filter) approach is needed. For this planning process, we identified a set of natural communities to use as the coarse filter and a set of at-risk species to use as the fine filter.

Example of the Coarse Filter/ Fine Filter Approach

Conserving multiple examples of headwater streams should conserve most, but not all, of the species that occur in that habitat. The blacknose shiner is a rare, state-listed fish species that occurs in headwater streams in the northern portions of the Sandhills, Shortgrass Prairie and Mixedgrass Prairie ecoregions in Nebraska. If one were to conserve 20 randomly selected, high quality examples of headwater streams across this range, there is a high probability that none of them would contain blacknose shiner. Thus, to conserve this species we must focus on this species individually and conserve headwater streams that contain blacknose shiner populations.

While we want to increase conservation throughout the state, there is a need to focus scarce resources on those areas that offer the best opportunities to conserve the full array of biological diversity and the best chances for success. To utilize the coarse filter/fine filter approach, we have selected as priorities those sites that have known occurrences of natural communities and populations of at-risk species. For many species that have low mobility or high site fidelity, it is important to conserve sites with known populations rather than sites with potential habitat for the species.

In order to be most effective at conserving biological diversity, we need to focus on those sites where there is the highest likelihood that the populations and communities will persist over the long term. For individual species, this would include sites with a large population size, good age class structure and evidence of successful reproduction. For natural communities, this would include sites with a good representation of expected native species, few invasive exotics, and relatively intact ecological processes that maintain these communities (e.g., fire, grazing, flooding). Unfortunately, for some community types such as saline or playa wetlands, there are few high quality examples remaining and for other types such as tall-grass prairie, there are no examples left that are of a size similar to what historically would have been found here. In these cases, habitat restoration will play an important role in conservation.

Another factor that affects viability is the landscape context within which the population or community exists. Species and communities do not occur in isolation but are part of a landscape mosaic. A number of species, particularly birds and mammals, utilize more than one habitat type during their life cycle and these habitats need to co-occur in close enough proximity to be useful. Species and communities are inextricably linked to the

landscapes in which they occur and thus may not persist over the long term without adequate conservation of the larger system. Functional landscapes can be defined as those in which the mosaic of native community types is relatively intact and the ecological processes that sustain the species and communities are still functioning or can be simulated through management (Poiani et al. 2000). We need to identify not only high quality examples of at-risk species populations and natural communities but also those that are nested together and exist within functional landscapes. Seeking landscapes with clusters of at-risk species and high quality communities also increases the efficiency of our conservation efforts.

A strategic approach to conservation also needs to take into account the distribution of species and communities when selecting sites. Species vary genetically across their range of distribution. This variation may be important to the long-term survival of the species in the face of environmental change. In a similar fashion, the species composition of individual community types can vary across the range of the type. For example, tall-grass prairie in the southeast portion of Nebraska can have a somewhat different mix of plants and animals than tall-grass prairie in the northeast part of the state. In order for the coarse filter to be effective, this variation needs to be captured in the planning process. While it is not practical to conduct detailed genetic analyses of all at-risk species or inventory all community types, a prudent alternative is to try and conserve examples of populations and communities from across their range.

One of the most difficult questions facing conservation planners is: How much is enough? How many populations of a species or examples of a community do we need to conserve in order to ensure long-term survival? We know that conserving just one example is likely inadequate and that we need to conserve multiple, high quality examples of each species and community type to provide redundancy and ensure persistence in the face of environmental and human-induced change. In addition to identifying "how much," conservation goals should have a geographic component so that examples are selected from across the range of the species or communities. This will help capture the variation and ensure that "not all your eggs are in one basket."

Although principles from genetics, conservation biology and ecology can offer guidance in setting quantitative conservation goals, our knowledge of the life history requirements of species and how ecosystems function is too incomplete to provide definitive answers. Groves (2003) suggests four reasons it is important to set quantitative conservation goals, even with the uncertainties involved:

1. Goals allow an evaluation of how effective a proposed system of conservation areas will be in representing the conservation targets.
2. Setting goals allows planners and managers to better understand and account for the trade-offs that often must be made in trying to sustain human communities and natural communities.
3. Goals will have a strong influence in determining the number of conservation areas that are needed.
4. Goals provide a vision for conservation success.

For the Nebraska Natural Legacy Project, we have set quantitative conservation goals using the best guidance currently available with the realization that these goals are an approximation and will no doubt change as new knowledge becomes available. Our conservation goals were set for the number of populations of a given species to be conserved rather than an overall population size and for the number of occurrences of a given natural community type rather than an overall number of acres of that type. These goals facilitate a conservation strategy that focuses on sites with known occurrences of species populations and high quality examples of natural communities.

One of the goals of the Nebraska Natural Legacy Project is to identify a set of priority landscapes that, if properly managed, would conserve the majority of Nebraska's biological diversity. These landscapes, which we are calling Biologically Unique Landscapes (BULs), were selected based on known occurrences of at-risk species and natural communities. In addition to at-risk species, these landscapes support a broad array of common species. The following sections describe the approach we used to identify the at-risk species, natural communities, and BULs.

Natural Communities: A Coarse Filter

A variety of entities have been used as a coarse filter in conservation planning, including natural communities (Anderson et al. 1999), ecological systems (Comer et al. 2003), physical features and landscapes. We have chosen to use natural communities as described in Natural Communities of Nebraska (Rolfsmeier and Steinauer 2010). Since the development of the initial Natural Legacy Project in 2005, the Natural Community classification has been revised. Appendix 7 includes the communities from the revised classification. The 84 terrestrial community types described here cover wetland and upland types (any habitat with rooted vegetation) and are part of the National Vegetation Classification system (Grossman et al. 1998), which is the standard classification used by federal agencies. Unfortunately, there currently is no statewide classification system for open water habitats (lakes, rivers, streams) and there is an urgent need for the development of such a system.

We have chosen to use natural communities because of the fine scale of resolution of this system, which is effective at "capturing" the full array of species and ecological processes. For example, the upland hardwood forests along the Missouri River bluffs harbor an almost completely different suite of plants and animals than the short-grass prairies in the panhandle, and both of these species assemblages would be distinct from the saline marshes in Lancaster County. In order to conserve the full array of species, we need to conserve examples of each of the community types.

For natural communities to be an effective coarse filter in capturing biological diversity, we need to select examples of communities that contain, as much as possible, the full complement of species one would expect in that type. For example, a never-plowed prairie that is used as pasture and has been treated with a broadleaf herbicide will harbor far fewer species than a similar prairie that has not been so treated. Broadleaf species (forbs) typically make up 80-90% of the plant species diversity in a prairie and there are

numerous insects that utilize those forbs. So the conservation of the pasture would be less effective at capturing biological diversity than conservation of the untreated prairie.

Examples of communities selected for conservation should also be part of an intact landscape and have more ecological processes intact or able to be simulated with management (e.g., fire, grazing). These examples have higher ecological integrity and are more likely to persist over the long term.

The Nebraska Natural Heritage Program has been collecting and maintaining information on natural communities since 1987. Field surveys record not only the location of occurrences and species present, but also rate the overall condition of the habitat. The Element Occurrence Ranking (EORanking) uses a four level scale (A-D) to rank the habitat based on its size, condition and landscape context. For example, an "A" quality occurrence of a prairie would be of relatively large size, containing most of the native species one would expect in that prairie type and few invasive exotic species, and be surrounded by relatively intact landscape. Data from the Heritage database on the location and condition of natural communities were used in selecting the Biologically Unique Landscapes (see below).

Setting Conservation Goals

Conservation goals for natural communities were set following the guidance in Anderson et al. (1999). Under these guidelines, the distribution of the community type in Nebraska, relative to the rest of its range, is a factor in setting goals. For example, a community type that occurs only in Nebraska (e.g., Sandhills fen, paper birch springbranch canyon forest) would have the highest quantitative goal since its conservation is entirely dependent on actions taken in Nebraska. Those community types whose distribution is mostly outside of Nebraska (peripheral) would have the lowest goals since they will be conserved primarily by actions that occur outside of the state.

In addition to the distribution of the community, the patch type of the community was used in setting goals. Communities can be classified into 3 main types: matrix, large patch, and small patch. A few community types are dominant (matrix-forming) and historically covered thousands to millions of acres. In Nebraska, these would include the main prairie types (e.g., tall-grass, mixed-grass, sandsage). The majority of community types are patch types and nest within the matrix types, covering only a small portion of the landscape. Large patch communities may form extensive cover over some areas but usually their boundaries are correlated with a dominant local process such as hydrology, landform, soil-type or fire pattern. These large patch types typically occur in patches of less than 1,000 acres. Examples in Nebraska include many of the forest and woodland communities. Small patch communities are even smaller and more restricted, requiring specific natural conditions. They typically occur in patches of 100 acres or less. Examples in Nebraska include many of the wetland and shrubland types.

Anderson et al. (1999) noted that as a general rule, conservation planners need to include more examples of patch communities to buffer against the higher probability of attrition over time because of environmental change. Patch communities are smaller in extent and

multiple examples may be needed to add up to substantial area and viable populations for specialist component species. In addition, individual examples may be less likely to contain the full complement of component species than a large example of a matrix community and thus more examples are needed to capture the full complement of species.

We developed the following criteria for setting goals for the number of occurrences of natural communities to conserve. Goals for each of the community types (e.g., tall-grass prairie) can be found in Appendix 7.

Goals for Natural Communities: Number of Occurrences to be Conserved

Distribution	Matrix	Large Patch	Small Patch
Endemic/Restricted	8	14	20
Limited	3	5	10
Widespread	1	2	5
Peripheral	1	2	5

Endemic/Restricted: communities that only occur within NE or generally have more than 90% of their range within the state.

Limited: communities that occur primarily within one region (e.g., Great Plains).

Widespread: communities that are common in a number of regions and widespread in NE.

Peripheral: communities that are found mainly in other regions, generally less than 10% of the range is within NE.

At-risk Species: The Fine Filter

In order to prioritize which species to focus scarce resources on, the Nebraska Natural Legacy Project Science Team developed a two-tiered approach to identifying those species that may be at-risk of extinction or extirpation from the state. The Tier I species are those that are globally or nationally at-risk. The Tier II list contains those species that are at-risk within Nebraska while apparently doing well in other parts of their range. The rationale for the two-tiered list was to focus attention and resources first on those species that may be headed for global extinction (and federal listing as Threatened or Endangered) and secondarily focus on those species that may be facing extirpation from Nebraska but appear to be stable globally. The Tier I list includes species that are currently state or federally listed as well as those that may be headed for listing. One goal of the Nebraska Natural Legacy Project is to prevent imperilment of species and the need for listing and another goal is recover currently listed species to allow for their de-listing. Additionally, there is a goal to keep common species common and the coarse filter (described in the previous section) should ensure this goal is met.

Species were chosen from a variety of taxa including mammals, birds, reptiles, amphibians, fishes, mollusks, insects, and plants. We did not have adequate information to evaluate certain taxa (e.g., fungi, bryophytes) and only certain types of invertebrates (e.g., mollusks, some groups of insects) had adequate information to allow evaluation of their imperilment status.

For the initial development of the Nebraska Natural Legacy Project, the Science Team developed criteria for selecting the Tier I and II species (see box) and selected an initial set of species that fit the Tier I criteria. This list was sent to experts on the various taxa for review. These reviews were used to revise the list. Toward the end of the process to develop the Natural Legacy Project, we conducted a series of expert workshops (mammals, birds, reptiles, fish, insects) and the list was reviewed again and revised. For the 2011 revision, the Science Team reviewed and revised the selection criteria and the taxa experts reviewed and revised the Tier I and Tier II lists in a series of workshops covering mammals, birds, reptiles, fish, insects, mollusks, and plants.

Criteria for Selecting Tier I At-risk Species

Species were included in the Tier I list that met one or more of the following criteria:

State and Federally Listed Species: Species listed as Threatened or Endangered under the federal Endangered Species Act or the Nebraska Non-game and Endangered Species Conservation Act. Recovery and de-listing of these species is a goal of the plan.

Heritage Ranked Species: Species ranked by NatureServe and the Natural Heritage Network as globally critically imperiled (G1), imperiled (G2) or vulnerable (G3). Or species ranked as either state critically imperiled (S1), imperiled (S2) or vulnerable (S3) in all or nearly all states in their range.

Declining species: Species whose abundance and/or distribution has been declining across much of their entire range. For land birds, the Partners in Flight national watch list was used as a guide.

Endemic Species (or nearly so): Species whose entire range of distribution occurs within or primarily within Nebraska. Conservation actions in Nebraska would be critical to the conservation of the species.

Disjunct Species: Species whose populations in Nebraska are widely disjunct (200+ miles) from the species' main range of distribution. Such populations may contain genetic variations that could be important to the long-term survival of the species. Species must be ranked as critically imperiled (S1) or imperiled (S2) within Nebraska.

Criteria for Selecting Tier II At-risk Species

Tier II species were those that did not meet the Tier I criteria but were ranked by the Nebraska Natural Heritage Program as either State Critically Imperiled (S1), State Imperiled (S2) or State Vulnerable (S3) (see Appendix 4 for explanation of ranks). For plant species, only species ranked S1 or S2 were selected.

Eighty-nine species were identified as meeting the Tier I criteria. The list of Tier I species is found in Appendix 8 along with information about their conservation status, range in Nebraska, stresses, inventory and research needs and a list of the Biologically Unique Landscapes where they are known to occur. We identified 679 species as meeting the Tier II criteria and the list is found in Appendix 9. During the development of the Nebraska Natural Legacy Project, the Heritage state ranks were reviewed and revised for amphibians, reptiles, mammals, fish, birds and a limited number of insects.

We have identified 768 species in Nebraska as at-risk (i.e., met Tier I or Tier II criteria). This is far too many to deal with in a detailed manner in conservation planning. We will focus most of our effort on the Tier I species. These are the species for which we are setting quantitative goals and identifying sites important to the conservation of the species. Tier II species were also used in identifying biologically unique landscapes but did not have specific goals set for them.

The Tier I and Tier II at-risk species lists will be periodically reviewed and updated by taxon experts. As new information on abundance, distribution, and population trends becomes available, species will be added to or removed from the lists. These lists were developed to help prioritize conservation planning/action and do not have legal or regulatory ramifications.

Setting Conservation Goals

Population viability analyses (PVAs) have been used for setting conservation goals for a limited number of species. These analyses are a quantitative method used to predict the future status of a population or collection of populations. During conservation planning in Florida (Cox et al 1994, Kautz and Cox 2001), population viability analyses were conducted on 11 focal species (birds, reptiles, mammals). Their results suggested that an appropriate goal for all the target species was to conserve a minimum of 10 populations. While detailed PVAs have been conducted for only a small number of species, the thought processes behind PVAs can be used in setting goals for other species. Using a simple equation (Morris et al. 1999), one can calculate the probability that all populations of a species will go extinct over a period of time given the probability of extinction of any given population. This model assumes that the fates of the individual populations are not correlated and that there is little movement among the populations.

We set an initial goal of 10 populations as a minimum for conserving a species. Using the equation from Morris et al. (1999) and assuming moderate viability of each population (40% chance of survival over a 100 year period), conservation of 10 populations gave a greater than 99% probability of at least one population surviving over that time period. This goal was then modified based on the proportion of the species' total distribution that was contained within Nebraska. For species that were endemic to Nebraska (or found also within a limited range outside the state), the goal was set at 10. These are species whose long-term protection will depend primarily on conservation actions taken in Nebraska. The goals were then reduced as the proportion of the species range outside of the state increased (see box below for goals). These species will be conserved by actions in a number of states, not just action in Nebraska. Regardless of distribution patterns, we set a minimum goal of 10 populations for state listed threatened and endangered species. This was to ensure the long-term survival of the species within Nebraska and enable de-listing.

Goals were also occasionally modified on a case by case basis. For example the Ute ladies'-tresses orchid (state and federally listed), after extensive surveys, has only two known populations in Nebraska. Populations of this species are sparsely distributed across its entire range and it is likely the current distribution in the state represents its pre-Euro-american settlement distribution. The goal for this species was set at two. Goals for all Tier I species are listed in Appendix 8.

Goals for Tier I Species: Number of Populations to be Conserved

Endemic/Restricted/State Listed	10
Limited	7
Widespread	4
Peripheral	1
Disjunct	1

Endemic/Restricted/State Listed: species that only occur within NE or generally have more than 90% of their range within the state.

Limited: species that occur primarily within one region (e.g., Great Plains).

Widespread: species that are common in a number of regions and widespread in NE.

Peripheral: species that are found mainly in other regions, generally less than 10% of the range is within NE.

Disjunct: Species whose populations in Nebraska are widely disjunct (200+ miles) from the species' main range of distribution.

Selecting Biologically Unique Landscapes

The goal of this process was to identify a set of landscapes that offer some of the best opportunities for conserving the full array of biological diversity in Nebraska. Landscapes were selected based on known occurrences of natural communities and at-risk species and were selected to meet the goals we had set for each community type and Tier I species.

We conducted two different analyses (SPOT and Heritage Hotspots) of data in the Natural Heritage database. Results of these analyses were used in conjunction with other spatial data layers to help delineate the boundaries of the landscapes.

SPOT (Spatial Portfolio Optimization Tool, see Appendix 5) is a computer algorithm that selects areas based on the goals, set by the user, for the number of occurrences of communities and species that are to be conserved. The program identifies a set of areas that meet identified goals in the least amount of total area with the least amount of fragmentation (most clustering of species and communities). In this analysis, we used data in the Heritage database for all terrestrial communities and the Tier I at-risk species. To help ensure that the best examples were selected, we used only those occurrences with an EORank of A or B, (for those occurrences that were ranked). The areas identified by this process can be viewed as the minimum area needed to meet the goals. The results can be displayed as a GIS layer or map.

The Heritage Hotspots layer was developed using the Section (square mile) grid of Nebraska (see Appendix 6). Each Section was given a score based on the number and conservation ranks of species and communities found within them. Sections were classified by score range (1-5, 6-10, etc) and the classes were portrayed in different colors to allow us to visually identify hotpots of natural community and at-risk species diversity. Data from all Heritage tracked species (Tier I and II) were used as well as the community data.

While the Heritage Database represents the most comprehensive, statewide data on at-risk species and natural communities in the state, inventory work is far from complete in Nebraska. Supplemental expert information was used to help delineate the landscapes. In addition to the above spatial data, we developed a GIS layer in which the Commission's District field staff had delineated areas that contain relatively intact and high quality habitat. We also conducted a series of workshops with species experts (fish, birds, mammals, insects, reptiles and amphibians). Participants in these workshops delineated areas in the state with high concentrations of at-risk species. In the case of the fish expert workshop, they also identified areas with high quality streams with a good overall diversity of species. And finally, we utilized the National Land Cover Data (1993) to help identify relatively intact landscapes.

The results from the SPOT analysis were used to identify the nuclei of the landscapes. The additional layers were used to expand the boundaries of the landscapes so that they were clusters of community and at-risk species occurrences within a relatively intact

landscape. There was no prioritization among landscapes, each contains a somewhat different assemblage of communities and species and therefore, each is needed to complete the conservation of Nebraska's biological diversity.

BUL Boundary Changes (2010)

Since 2005, local biologists have focused their work in Biologically Unique Landscapes, and have collected more information about species and natural communities. They requested a process to modify the boundaries. Due to the tight timeframe of our 2010 revision process, we did not re-run the GIS analyses that were used in delineating the initial set of BULs. Instead, the Nebraska Natural Legacy Science Team developed a set of criteria for evaluating proposed changes to the BUL system (see Appendix 11). A request for boundary change proposals was sent out to conservation practitioners who have been working in the BULs. The Science Team reviewed the initial proposals, made suggestions for changes to the proposals, reviewed the final proposals, and then made recommendations for each proposal to the Natural Legacy Partnership Team for final approval.

Five minor BUL boundary adjustments were approved; Southeast Prairies, Saline Wetlands, Verdigris-Bazile, Middle Niobrara, and Central Loess Hills. A major boundary adjustment was approved for the Rainwater Basin. This area was delineated using different criteria than the other BULs. The Rainwater Basin boundary was delineated using physical features (soils, topography), rather than biological features used for other BULs (occurrences of at-risk species and natural communities), and was designed to encompass all the wetlands in the landscape. The large size of the landscape is important. Annual spatial variation in precipitation means that wetlands in some parts of the landscape may be dry in a given year while others may have water. Thus, wetlands need to be conserved over a large geographic area to insure that some are suitable as migratory stopover sites in a given year. Another difference is that other BULs were delineated to include relatively intact landscapes while the RWB is primarily an agricultural landscape with imbedded wetlands. When the focus of conservation is migratory stopover sites, it may be less important that the landscape is intact than when trying to conserve resident species.

Analysis of BUL System

An analysis was conducted to see how well the set of 40 Biologically Unique Landscapes offered opportunities to meet the quantitative conservation goals set for communities and Tier I species. Documented occurrences and expert knowledge of locations of species and communities were assessed to determine if there was ample opportunity in the existing system of BULs to meet the conservation goals specified in the Nebraska Natural Legacy Project. Ample opportunity was identified when there were numerous occurrences (many more than the goal) of the given species or community within multiple BULs, or when the entire, or nearly entire, range of the species or community in the state occurs within BULs. The existing system of BULs provided ample opportunity to meet the conservation goals for 66 (74%) of the Tier I species. For all but one of the remaining Tier I species, their goals could be partially met within the existing system.

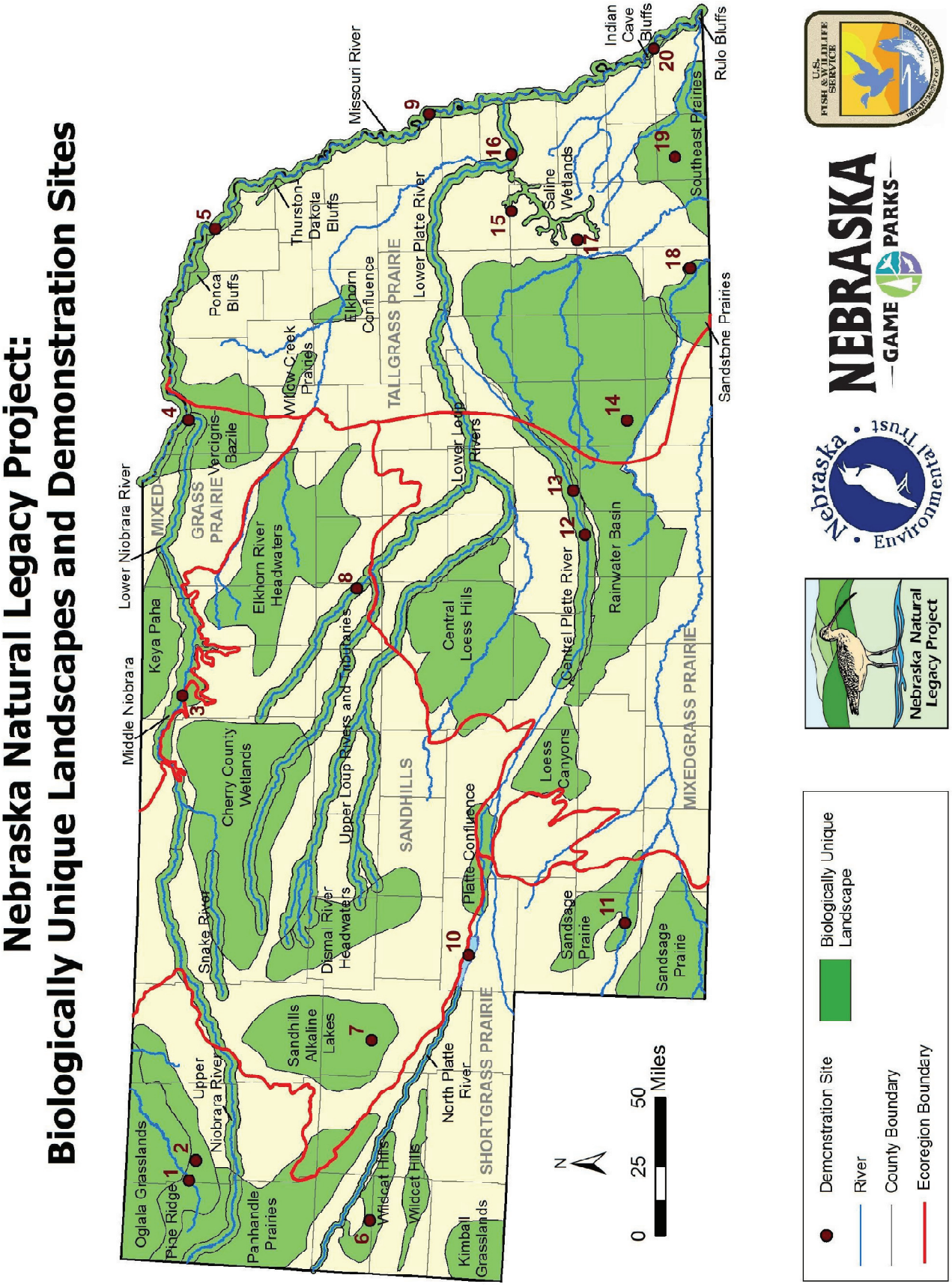
Many of these species whose goals weren't met, have few documented occurrences and their distributions are poorly known, so it is unclear how well the system may meet their needs. For natural communities, the system provided ample opportunity to meet the goals for 75 (90%) of the community types. The goals for the remaining community types can be partially met in the current system. The high percentage of community goals met by the current BULs indicates that the system is suitable for conserving the vast majority of common species.

The current set of BULs may not be adequate to address the needs of wide-ranging species. We did not attempt to identify corridors or connections between landscapes that would allow for the movement of these species. The lack of corridor identification may also mean that the current BUL system may not provide for species that need to shift their distribution range in response to climate change. In addition, migratory bird species that do not have high fidelity to nesting sites (e.g., many grassland nesting birds) may not be captured well by this approach. While nesting record data were used to identify landscapes, there is no guarantee that the birds will return to those sites in subsequent years. However, given our limited knowledge of the habitat requirements of most species, it may be safest to target action at those sites where they are known to nest rather than potential habitat. Similarly, those species that only occur in Nebraska during their migration and do not have high fidelity to particular stopover sites (e.g., whooping crane) may not be well served. While a number of selected landscapes have documented occurrences of whooping crane roost sites, we do not have data indicating which of those may be used more often than others.

While the set of landscapes described here does not meet the needs of all species in Nebraska, it appears to offer ample opportunity to meet the needs of the vast majority. Many of the BULs are quite large and no doubt further inventory work will identify additional occurrences of at-risk species and natural communities. Further inventory is also needed to be able to identify additional landscapes to round out the system.

Natural Legacy Demonstration Sites

A set of demonstration sites was selected to represent examples of habitat conservation opportunities in the state of Nebraska. A multi-organizational team of conservation practitioners chose sites that currently demonstrate or have great potential to demonstrate the mission of the Nebraska Natural Legacy Project. For more information on Natural Legacy Demonstration Sites, see Chapter 4.


Nebraska Natural Legacy Project:
Biologically Unique Landscapes and Demonstration Sites
Oglala Grasslands
Pine Ridge
Panhandle Prairies
Upper Niobrara River
Lower Niobrara River
Middle Niobrara
Keya Paha
MIXED GRASS PRAIRIE
Cherry County Wetlands
Snake River
Sandhills Alkaline Lakes
Wildcat Hills
Wildcat Hills
North Platte River
Kimball Grasslands
SHORTGRASS PRAIRIE
Verdigris Bazile
Elkhorn River Headwaters
Disma River Headwaters
Upper Loup Rivers and Tributaries
SANDHILLS
Platte Confluence
Central Loess Hills
Lower Loup Rivers
Ponca Bluffs
Willow Creek Prairies
Thurston Dakota Bluffs
Elkhorn Confluence
TALLGRASS PRAIRIE
Lower Platte River
Missouri River
Saline Wetlands
Central Platte River
Rainwater Basin
Loess Canyons
Sandsage Prairie
Sandsage Prairie
MIXEDGRASS PRAIRIE
Southeast Prairies
Indian Cave Bluffs
Rulo Bluffs
Sandstone Prairies
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
N
0
25
50
Miles
Demcnstration Site
River
County Boundary
Ecoregion Boundary
Biologically Unique Landscape
Nebraska Natural Legacy Project
Nebraska Environmental Trust
NEBRASKA GAME PARKS
U.S. FISH & WILDLIFE SERVICE

Nebraska Natural Legacy Project Demonstration Sites

1 Fort Robinson State Park
2 Ponderosa Pine Wildlife Management Area
3 Niobrara Valley Preserve
4 Niobrara River State Park
5 Ponca State Park
6 Wildcat Hills
7 Crescent Lake National Wildlife Refuge
8 Calamus Wildlife Management Area and State Recreation Area
9 Boyer Chute National Wildlife Refuge
10 Lake McConaughy
11 Enders Reservoir
12 Lillian Annette Rowe Bird Sanctuary
13 Platte River Prairies
14 Kissinger Basin Wildlife Management Area
15 Saline Wetland Complex
16 Schramm Park State Recreation Area
17 Spring Creek Prairie
18 Rock Glen WMA and Rock Creek Station State Historical Park
19 Burchard Lake Wildlife Management Area
20 Indian Cave State Park